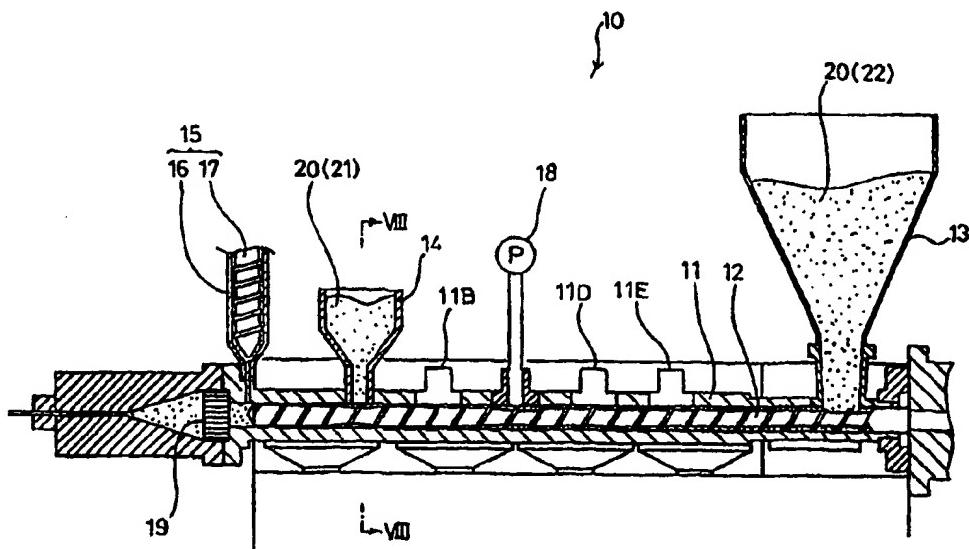




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ :		A1	(11) International Publication Number: WO 99/28110
B29C 47/04, 47/06, 47/10, 47/60, B44F 9/02 // B29K 105:16, 511:14			(43) International Publication Date: 10 June 1999 (10.06.99)
(21) International Application Number: PCT/JP98/02263		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GW, HU, ID, IL, IS, KE, KG, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).	
(22) International Filing Date: 22 May 1998 (22.05.98)			
(30) Priority Data: 9/333779 4 December 1997 (04.12.97) JP			
(71) Applicant (for all designated States except US): MISAWA HOMES CO., LTD. [JP/JP]; 4-5, Takaido-Higashi 2-chome, Suginami-ku, Tokyo 168-0072 (JP).			
(72) Inventors; and		Published	
(73) Inventors/Applicants (for US only): KATO, Masami [JP/JP]; Misawa Homes Co., Ltd., 4-5, Takaido-Higashi 2-chome, Suginami-ku, Tokyo 168-0072 (JP). HASEMI, Konomi [JP/JP]; Misawa Homes Co., Ltd., 4-5, Takaido-Higashi 2-chome, Suginami-ku, Tokyo 168-0072 (JP). ISHIKAWA, Masatoshi [JP/JP]; Sumiyoshi Kasei Corporation, 779-6, Shinozu, Shiraoka-machi, Minamisaitama-gun, Saitama 349-0204 (JP).		With international search report.	
(74) Agent: KITAMURA, Hitoshi; Oumikaikan Building, 4th floor, 3-7, Higashi-Nihonbashi 3-chome, Chuo-ku, Tokyo 103-0004 (JP).			

(54) Title: METHOD OF MANUFACTURING MOLDING AND MIXING DEVICE FOR MANUFACTURING MOLDING



(57) Abstract

A manufacturing technology by which clear colors and patterns can be brought out without a remarkable lowering of strength. Immediately before delivery to a metal mold, outer resin material (21) positioned on the main cylinder (11) inner wall side is put in the molten state, and inner resin material (22) positioned on the main screw (12) side is controlled to be from the softening temperature to the melting temperature both inclusive to be extrusion-molded as they are. For example, the temperature of a heater device for heating the main cylinder and the main screw is controlled.

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formed into a desired shape by extrusion molding or injection molding. According to this technology, it is possible to provide a method of manufacturing a wood-like product and a wood-like product which has a pattern very close to the grain of natural wood and also has feeling such as the touch or the like close to the natural wood.

(Disadvantage of the prior art)

It is, however, true that not only in the above technology, giving of coloring to a resin molding is hard to be incompatible with keeping the strength of the resin molding. That is, it is preferable to incompletely mix resin in order to give coloring to the resin molding, but if done so, the strength of the molding is lowered. On the contrary, if mixing is performed completely, the strength of the molding can be increased, but the coloring fades.

(Objects of the invention)

A problem to be solved by the invention is to provide the technology by which giving of coloring to a resin molding is made compatible with preventing a remarkable lowering of strength of the resin molding.

It is an object of the invention as claimed in claims 1 to 17 to provide a method of manufacturing a molding by which clear colors and patterns can be presented without a remarkable lowering of strength.

It is an object of the invention as claimed in claims 18 to 34 to provide a mixing device for extrusion molding, by which clear colors and patterns can be presented without a remarkable lowering of strength.

Further in detail, listed are the respective objects of the invention.

The object of the invention as claimed in claim 1 is to provide a manufacturing method, by which clear colors and

patterns can be presented without a remarkable lowering of strength.

The object of the invention as claimed in claim 2 is to provide a manufacturing method, by which a molding having a clear pattern can be manufactured.

The object of the invention as claimed in claims 3 and 4 is to provide a manufacturing method, in which the control concerned with manufacture is simple.

The object of the invention as claimed in claims 5, 6, 7, 8, 14, 15, 16 and 17 is to provide a method of manufacturing a molding having the woody feel.

The object of the invention as claimed in claims 9, 10, 11, 12 and 13 is to provide a method of manufacturing a molding which contributes to recycle.

The object of the invention as claimed in claim 18 is to provide a mixing device for extrusion molding, by which energy required for manufacture can be held down.

The object of the invention as claimed in claims 19, 20, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33 and 34 is to provide a manufacturing method, by which a molding having a clear pattern can be manufactured.

The object of the invention as claimed in claims 21 and 22 is to provide a mixing device for extrusion molding, by which the existing equipment can be utilized to the maximum.

DISCLOSURE OF THE INVENTION

The present invention is intended for accomplishing the described objects.

(Claim 1)

The invention as claimed in claim 1 is a molding manufacturing method using a mixing device 10 for extrusion

molding comprising a main cylinder 11 positioned on this side of a metal mold for shaping a molding and a main screw 12 rotated in the main cylinder 11 for mixing resin material 20 and delivering the same to the metal mold, wherein immediately before delivery to the metal mold, an outer resin material 21 positioned on the inner wall side of the main cylinder 11 is put in the molten state, and an inner resin material 22 positioned on the main screw 12 side is controlled to be from the softening temperature to the melting temperature both inclusive.

The "main" of the "main cylinder 11" means any one of cylinders in multilayer molding, for example, and the only one cylinder in monolayer molding. The "main" of the "main screw 12" means a screw incorporated in the main cylinder, and in the case of using plural screws in the main cylinder, it means all of the screws.

As concrete means for "immediately before delivery to the metal mold, putting an outer resin material 21 positioned on the inner wall side of the main cylinder 11 in the molten state, and controlling an inner resin material 22 positioned on the main screw 12 side to be from the softening temperature to the melting temperature both inclusive", cited are means for controlling the temperature of a heater for heating the main cylinder and the main screw, means for making the particle size of resin material positioned on the main cylinder inner wall side smaller than that of resin material positioned on the main screw side, and the like.

(Description of terms)

Here, "resin material" means material used at the time of making a resin molding such as polyvinyl chloride which is thermoplastic resin or the like. Though only the resin as base material will be resin material, if wood flour

(cellulose material) is contained in resin, it becomes resin material used in the so-called wood plastic molding.

As for the resin material used in wood plastic molding, it is frequent to use the material obtained by mixing wood flour with resin and pelletizing the same in addition to the powdered material obtained by mixing wood flour with powder resin. Further, frequently in order to produce a pattern of the grain of wood, "resin material" is added to wood flour and resin to obtain a mixture of a pigment. In that case, sometimes one kind of a pigment will be sufficient, and sometimes plural kinds of pigments are used. In the case of using plural kinds of pigments, "resin material" can be made by preparing plural kinds of pellets with different pigments and mixing the same.

(Operation)

Immediately before delivery to the metal mold, outer resin material 21 of the resin material 20 is to be put in the molten state, so that while being clamped between the inner wall of the main cylinder 11 and an inner resin material 22, it is rubbed by the inner wall of the main cylinder 11 to be mixed. Soon at the time of delivery from the forward end of the main screw 12 to the metal mold, the material is clamped between the inner wall of the main cylinder 11 and the forward end part of the main screw 12 to be delivered.

On the other hand, the inner resin material 22 is controlled to be from the softening temperature to the melting temperature both inclusive, so that it is delivered in the state of being little mixed to the metal mold.

Since the outer resin material 21 of the resin material 20 is mixed, the strength will not be lowered remarkably unlike the case in which every resin for forming

a molding is mixed merely incompletely.

(Claim 2)

The invention as claimed in claim 2 defines the method of manufacturing a molding as claimed in claim 1, wherein the outer resin material 21 is made different from the inner resin material 22 in color.

As means for varying the color of resin material, means for varying the kind of a pigment to be mixed with the resin material is general.

If plural kinds of pigments different in color are mixed with the outer resin material 21 turned to be molten, sometimes it is possible to bring out a delicate tone of color. Mixing to such a degree not to lower the strength of a molding causes the case where as plural kinds of pigments are made monochromatic, sometimes mixing is not completely performed.

(Operation)

According to the present invention as claimed in claim 2, the outer resin material 21 is not completely mixed with the inner resin material 22 not molten. Accordingly, it is possible to manufacture a molding which will not turn to a color intermediate between the outer resin material 21 and the inner resin material 22.

(Claim 3)

The invention as claimed in claim 3 defines the method of manufacturing a molding as claimed in claim 1, wherein, the outer resin material 21 is thrown in later than the inner resin material 22 is thrown in the main cylinder 11.

(Claim 4)

The invention as claimed in claim 4 defines the method of manufacturing a molding as claimed in claim 2,

wherein the outer resin material 21 is thrown in later than the inner resin material 22 is thrown in the main cylinder 11.

As means for later throwing in the outer resin material 21, the outer resin material 21 is thrown in from the position on the metal mold side separately from the inner resin material 22 mixed "in such a manner as to be from the softening temperature to the melting temperature both inclusive on the main screw 12 side". At that time, the material may be put in the molten state after it is thrown in the main cylinder 11, and also the molten material may be thrown therein.

(Operation)

Since the outer resin material 21 is to be thrown in the main cylinder 11 later than the inner resin material 22, the control on manufacture is more simple than that in the case of throwing in the outer resin material 21 and the inner resin material 22 at one time.

(Claim 5)

The invention as claimed in claim 5 defines the method of manufacturing a molding as claimed in claim 1, wherein cellulose material is mixed with the outer resin material 21.

(Claim 6)

The invention as claimed in claim 6 defines the method of manufacturing a molding as claimed in claim 2, wherein cellulose material is mixed with the outer resin material 21.

(Claim 7)

The invention as claimed in claim 7 defines the method of manufacturing a molding as claimed in claim 3, wherein cellulose material is mixed with the outer resin

material 21.

(Operation of claim 5, 6 or 7)

As cellulose material is contained in the outer resin material 21, a molding has the wood feeling brought out on the surface thereof.

(Claim 8)

The invention as claimed in claim 8 defines the method of manufacturing a molding as claimed in claims 5, 6 and 7, wherein, cellulose material mixed with the outer resin material 21 is fixed grains formed by fixing a surface grain which has a diameter smaller than that of the pulverized powder obtained by pulverizing the cellulose material and is harder than the powder to the outer peripheral surface of the pulverized powder.

The cellulose material used in manufacturing fixed grains is ordinarily natural wood, or sawdust, but rice straw and bagasse may be used.

As a method of forming fixed grains by "fixing surface grains which have a diameter smaller than that of the granular powder and are harder than the powder to the surface of pulverized powder", cited are grinding using a ball mill, long-time high-speed mixing using a mixer, and so on. By these methods, fuzz of fibers of the cellulose material is decreased. Processing for removing fuzz of fibers of the cellulose material may be performed separately from fixing of surface grains.

The "surface grains" are metal, metal compounds such as titanium oxide, ferrite, aluminium, nickel, silver, calcium carbonate and the like, and nonmetal such as ceramic or the like.

The percentage of fixed grains mixed with resin to the whole is usually set not more than 30 wt%. The reason is

holding the outer resin material 21 and a sub-throw in hole for delivering the outer resin material 21 to the main cylinder 11, the sub-throw in hole being communicated with a receiving hole positioned between the metal mold in the main cylinder 11 and the main throw-in machine 13.

(Description of terms)

The "main throw-in machine" is generally called "hopper".

The sub-cylinder of the "sub-throw in machine" may be a hopper, but as defined in the claim 13, it may be provided with a screw.

(Operation)

As the sub-throw-in machine is provided separately from the main throw-in machine (e.g. main hopper 13) for throwing in the inner resin material 22, it is easy to put the outer resin material 21 in the molten state and control the inner resin material 22 to be from the softening temperature to the melting temperature both inclusive.

(Claim 20)

The invention as claimed in claim 20 defines the mixing device for manufacturing a molding as claimed in claim 19 wherein the receiving hole of the main cylinder 11 (e.g. formed by removing a receiving hole forming member 11A) is formed in such a manner as to expand the receiving hole 11A on the rotating direction side of the main screw 12 in the cylinder inner wall.

The receiving hole 11A is expanded by providing a notch part 11F by chamfering using an inversed spot facing tool.

(Operation)

As the rotating direction side of the main screw 12 in the receiving hole 11A is expanded, the outer resin

material 21 can be smoothly thrown in.

(Claim 21)

The invention as claimed in claim 21 defines the mixing device for manufacturing a molding as claimed in claim 19, wherein the receiving hole 11A is a vent hole 11B previously provided in the mixing device 10 for extrusion molding.

(Claim 22)

The invention as claimed in claim 22 defines a mixing device for manufacturing a molding as claimed in claim 20, wherein the receiving hole 11A is a vent hole 11B previously provided in the mixing device 10 for extrusion molding.

(Description of terms)

Here, the "vent hole 11B" is an air vent hole provided for removing gas contained in resin material or generated from resin material. As air is let escape from the vent hole 11B according to the kind of resin material and the property of a molding in some case, if there are provided plural vent holes 11B, one can be used as a feed port for the outer resin material 21 and the other can be used as an air vent hole.

(Operation)

Since the ordinary mixing device for extrusion molding is provided with a vent hole, it can be applied, so that the existing equipment can be utilized.

(Claim 23)

The invention as claimed in claim 23 defines a mixing device for manufacturing a molding as claimed in claim 19, wherein the sub-throw in machine 15 is provided with a sub-screw 17 rotated in the sub-cylinder 16 for mixing and delivering the outer resin material 21 held in the sub-cylinder 16.

(Claim 24)

The invention as claimed in claim 24 defines a mixing device for manufacturing a molding as claimed in claim 20, wherein the sub-throw in machine 15 is provided with a sub-screw 17 rotated in the sub-cylinder 16 for mixing and delivering the outer resin material 21 held in the sub-cylinder 16.

(Claim 25)

The invention as claimed in claim 25 defines a mixing device for manufacturing a molding as claimed in claim 21 or 22, wherein the sub-throw in machine 15 is provided with a sub-screw 17 rotated in the sub-cylinder 16 for mixing and delivering the outer resin material 21 held in the sub-cylinder 16.

(Operation)

On this side of a metal mold in the main cylinder 11, the outer resin material 21 to be put in the molten state is molten and mixed and then fed into the main cylinder 11 by the sub-cylinder 16 and the sub-screw 17.

(Claim 26)

The invention as claimed in claim 26 defines the mixing device for manufacturing a molding as claimed in claim 19, wherein there are provided plural (e.g. five) receiving holes of the main cylinder 11 in the direction of extrusion.

(Claim 27)

The invention as claimed in claim 27 defines the mixing device for manufacturing a molding as claimed in claim 20, wherein there are provided plural (e.g. five) receiving holes of the main cylinder 11 in the direction of extrusion.

(Claim 28)

The invention as claimed in claim 28 defines the

mixing device for manufacturing a molding as claimed in claim 21 or 22, wherein there are provided plural (e.g. five) receiving holes of the main cylinder 11 in the direction of extrusion.

(Claim 29)

The invention as claimed in claim 29 defines the mixing device for manufacturing a molding as claimed in claim 23, 24 or 25, wherein there are provided plural (e.g. five) receiving holes of the main cylinder 11 in the direction of extrusion.

(Operation of claims 26 to 29)

As there are provided plural receiving holes 11 of the main cylinder 11 in the direction of extrusion, it is possible to select and use the receiving holes appropriate for a molding according to various conditions such as desired colors and patterns, the kind of resin and the like. Further, the receiving hole can be used as a vent hole.

(Claim 30)

The invention as claimed in claim 30 defines the mixing device for manufacturing a molding as claimed in claim 19, wherein the area in the main screw 12 that corresponds to the receiving hole is formed in such a manner that the diameter of the main screw 12 is smaller than that of the other area.

(Claim 31)

The invention as claimed in claim 31 defines the mixing device for manufacturing a molding as claimed in claim 20, wherein the area in the main screw 12 that corresponds to the receiving hole is formed in such a manner that the diameter of the main screw 12 is smaller than that of the other area.

(Claim 32)

The invention as claimed in claim 32 defines the mixing device for manufacturing a molding as claimed in claim 21 or 22, wherein the area in the main screw 12 that corresponds to the receiving hole is formed in such a manner that the diameter of the main screw 12 is smaller than that of the other area.

(Claim 33)

The invention as claimed in claim 33 defines the mixing device for manufacturing a molding as claimed in claim 23, 24, 25 wherein the area in the main screw 12 that corresponds to the receiving hole is formed in such a manner that the diameter of the main screw 12 is smaller than that of the other area.

(Claim 34)

The invention as claimed in claim 34 defines the mixing device for manufacturing a molding as claimed in claim 26, 27, 28 and 29 wherein the area in the main screw 12 that corresponds to the receiving hole is formed in such a manner that the diameter of the main screw 12 is smaller than that of the other area.

(Operation of claims 30 to 34)

The area in the main screw 12 that corresponds to the receiving hole is formed in such a manner that the diameter of the main screw 12 is smaller than that of the other area, whereby the outer resin material 21 can be smoothly thrown in from the receiving hole.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a sectional view showing the outline of a first embodiment according to the present invention; Figure 2 is an enlarged view showing the principal part in the first embodiment; Figure 3 is a sectional view showing

put in the sub-mixing machine 15 and the sub-hopper 14 as pellets different in coloring. Thus, the molten state of the outer resin material 21 can be made different from that of the first, second or third embodiment so as to contribute to a delicate coloring.

Also in the described arrangement, it is possible to manufacture moldings which are different in the appearance pattern from that of the first or second or third embodiment but have the substantially same quality as that thereof.

(Variation)

As shown in the first to fourth embodiments, plural throw-in holes can be freely formed on the mixing device 10 for manufacturing a molding, whereby it is possible to manufacture moldings, the appearances of which have various tones of color.

Further, the position of the vent hole which has been described as the same place (11C) in the above embodiments can be suitably selected.

ADVANTAGES OF THE INVENTION

According to the present invention, it is possible to provide the technology by which giving of coloring to a resin molding is made compatible with preventing a remarkable lowering of strength of the resin molding.

The advantages are listed by each claim.

According to the invention as claimed in claim 1, it is possible to provide a manufacturing method, by which colors and patterns can be produced without a remarkable lowering of strength.

According to the invention as claimed in claim 2, it is possible to provide a manufacturing method, by which moldings having clear patterns can be manufactured.

According to the invention as claimed in claims 3 and 4, it is possible to provide a manufacturing method, in which the control concerning manufacture is simple.

According to the invention as claimed in claims 5, 6, 7, 8, 14, 15, 16 and 17, it is possible to provide a method of manufacturing moldings having the wood feel.

According to the invention as claimed in claims 9, 10, 11, 12 and 13, it is possible to provide a method of manufacturing moldings which contribute to recycle.

According to the invention as claimed in claim 18, it is possible to provide a mixing device for extrusion molding, by which energy required for manufacture can be held down.

According to the invention as claimed in claims 19, 20, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33 and 34, it is possible to provide a manufacturing method, by which moldings having clear patterns can be manufactured.

According to the invention as claimed in claims 21 and 22, it is possible to provide a mixing device for extrusion molding, by which the existing equipment can be utilized to the utmost.

FIELD OF INDUSTRIAL USE

This invention is utilized in the field of industry using the technology of molding in such a manner as to present clear surface patterns, for example, pattern of the grain of wood and not to lower the strength remarkably in plastics containing a pigment.

CLAIMS

1. A method of manufacturing moldings using a mixing device for extrusion molding including a main cylinder positioned on this side of a metal mold for forming moldings, and a main screw rotated in said main cylinder for mixing resin material and delivering the same to said metal mold, wherein immediately before delivery to a metal mold, outer resin material positioned on the main cylinder inner wall side is put in the molten state, and inner resin material positioned on the main screw side is controlled to be from the softening temperature to the melting temperature both inclusive.
2. The method of manufacturing moldings as claimed in claim 1, wherein said outer resin material is made different from said inner resin material in a color.
3. The method of manufacturing moldings as claimed in claim 1, wherein said outer resin material is thrown in said main cylinder later than said inner resin material.
4. The method of manufacturing moldings as claimed in claim 2, wherein said outer resin material is thrown in said main cylinder later than said inner resin material.
5. The method of manufacturing moldings as claimed in claim 1, wherein cellulose material is mixed with said outer resin material.
6. The method of manufacturing moldings as claimed in claim 2, wherein cellulose material is mixed with said outer resin material.
7. The method of manufacturing moldings as claimed in claim 3, wherein cellulose material is mixed with said outer resin material.

8. The method of manufacturing moldings as claimed in claim 5, 6 or 7, wherein cellulose material mixed with said outer resin material is fixed grains formed by fixing surface grains which have a diameter smaller than that of pulverized powder obtained by pulverizing cellulose material and are harder than said powder to the outer peripheral surface of said pulverized powder.

9. The method of manufacturing moldings as claimed in claim 1, wherein regenerated resin is contained in said inner resin material.

10. The method of manufacturing moldings as claimed in claim 2, wherein regenerated resin is contained in said inner resin material.

11. The method of manufacturing moldings as claimed in claim 3, wherein regenerated resin is contained in said inner resin material.

12. The method of manufacturing moldings as claimed in claim 4 ,wherein that regenerated resin is contained in said inner resin material.

13. The method of manufacturing moldings as claimed in claim 5, wherein regenerated resin is contained in said inner resin material.

14. The method of manufacturing moldings as claimed in claim 5, 6 or 7, wherein cellulose material is mixed with said inner resin material.

15. The method of manufacturing moldings as claimed in claim 8, wherein cellulose material is mixed with said inner resin material.

16. The method of manufacturing moldings as claimed in claim 9, 10, 11, 12 or 13, wherein cellulose material is mixed with said inner resin material.

17. The method of manufacturing moldings as

claimed in claim 14, 15 or 16, wherein cellulose material mixed with said inner resin material is fixed grains formed by fixing surface grains which have a diameter smaller than pulverized powder obtained by pulverizing cellulose material and are harder than said powder to the outer peripheral surface of said pulverized powder.

18. A mixing device for manufacturing moldings, in a mixing device for extrusion molding including a main cylinder positioned on this side of a metal mold for forming moldings, and a main screw rotated in said main cylinder for mixing resin material and delivering the same to said metal mold, wherein said device is formed in such a manner that immediately before delivery to a metal mold, outer resin material positioned on the main cylinder inner wall side is put in the molten state and inner resin material positioned on the main screw side is controlled to be from the softening temperature to the melting temperature both inclusive.

19. The mixing device for manufacturing moldings as claimed in claim 18, wherein said device includes a sub-throw in machine for throwing said outer resin material in said mixing device for extrusion molding, said sub-throw in machine is provided separately from a main throw-in machine for throwing in said inner resin material and comprises an outer resin material holding part for holding said outer resin material and a sub-throw in hole for delivering said outer resin material to said main cylinder, and said sub-throw in hole is communicated with a receiving hole positioned between said metal mold and said main throw-in machine in said main cylinder.

20. The mixing device for manufacturing moldings as claimed in claim 19, wherein the rotating direction side of said main screw in the cylinder inner wall of said

receiving hole of said main cylinder is formed in such a manner as to expand said receiving hole.

21. The mixing device for manufacturing moldings as claimed in claim 19, wherein said receiving hole is a vent hole previously provided in said mixing device for extrusion molding.

22. The mixing device for manufacturing moldings as claimed in claim 20, wherein said receiving hole is a vent hole previously provided in said mixing device for extrusion molding.

23. The mixing device for manufacturing moldings as claimed in claim 19, wherein said sub-throw in machine includes a sub-screw rotated in said sub-cylinder for mixing outer resin material held in said sub-cylinder and delivering the same.

24. The mixing device for manufacturing moldings as claimed in claim 20, wherein said sub-throw in machine includes a sub-screw rotated in said sub-cylinder for mixing outer resin material held in said sub-cylinder and delivering the same.

25. The mixing device for manufacturing moldings as claimed in claim 21 or 22, wherein said sub-throw in machine includes a sub-screw rotated in said sub-cylinder for mixing outer resin material held in said sub-cylinder and delivering the same.

26. The mixing device for manufacturing moldings as claimed in claim 19, wherein there are plural receiving holes of said main cylinder in the direction of extrusion.

27. The mixing device for manufacturing moldings as claimed in claim 20, wherein there are plural receiving holes of said main cylinder in the direction of extrusion.

28. The mixing device for manufacturing moldings

as claimed in claim 21 or 22 , wherein there are plural receiving holes of said main cylinder in the direction of extrusion.

29. The mixing device for manufacturing moldings as claimed in claim 23, 24 or 25, wherein there are plural receiving holes of said main cylinder in the direction of extrusion.

30. The mixing device for manufacturing moldings as claimed in claim 19, wherein an area corresponding to said receiving hole in said main screw is formed in such a manner that the diameter of said main screw is made smaller than that in the other area.

31. The mixing device for manufacturing moldings as claimed in claim 20, wherein an area corresponding to said receiving hole in said main screw is formed in such a manner that the diameter of said main screw is made smaller than that in the other area.

32. The mixing device for manufacturing moldings as claimed in claim 21 or 22, wherein an area corresponding to said receiving hole in said main screw is formed in such a manner that the diameter of said main screw is made smaller than that in the other area.

33. The mixing device for manufacturing moldings as claimed in claim 23, 24 or 25, wherein an area corresponding to said receiving hole in said main screw is formed in such a manner that the diameter of said main screw is made smaller than that in the other area.

34. The mixing device for manufacturing moldings as claimed in claim 26, 27, 28 or 29, wherein an area corresponding to said receiving hole in said main screw is formed in such a manner that the diameter of said main screw is made smaller than that in the other area.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference FP-119-PCT	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/JP 98/ 02263	International filing date (day/month/year) 22/05/1998	(Earliest) Priority Date (day/month/year) 04/12/1997
Applicant MISAWA HOMES CO., LTD. et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 4 sheets.

It is also accompanied by a copy of each prior art document cited in this report.

1. Certain claims were found unsearchable (see Box I).
2. Unity of invention is lacking (see Box II).
3. The international application contains disclosure of a nucleotide and/or amino acid sequence listing and the international search was carried out on the basis of the sequence listing
 - filed with the international application.
 - furnished by the applicant separately from the international application,
 - but not accompanied by a statement to the effect that it did not include matter going beyond the disclosure in the international application as filed.
 - Transcribed by this Authority
4. With regard to the title,
 - the text is approved as submitted by the applicant
 - the text has been established by this Authority to read as follows:
5. With regard to the abstract,
 - the text is approved as submitted by the applicant
 - the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this International Search Report, submit comments to this Authority.
6. The figure of the drawings to be published with the abstract is:

Figure No. 1

 - as suggested by the applicant.
 - because the applicant failed to suggest a figure.
 - because this figure better characterizes the invention.
 - None of the figures.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/JP 98/02263

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 B29C47/04 B29C47/06 B29C47/10 B29C47/60 B44F9/02
 //B29K105:16, B29K511:14

According to International Patent Classification(IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 B29C B44F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 966 857 A (RALPH W. CHARLTON ET AL) 29 June 1976	1
Y	see column 2, line 34 - line 39; claims 1,2; figure 1 ---	3,5,7, 14,17
X	DE 19 33 570 A (LUDWIG MAURER) 21 January 1971 see claims 1,6 ---	18,19, 23,24
X	PATENT ABSTRACTS OF JAPAN vol. 012, no. 045 (M-667), 10 February 1988 & JP 62 198435 A (BANDO CHEM IND LTD), 2 September 1987 see abstract; figures 1-4 ---	18,19, 23,24
	-/-	

 Further documents are listed in the continuation of box C. Patent family members are listed in annex.

° Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

Date of mailing of the international search report

26 August 1998

04/09/1998

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
 NL - 2280 HV Rijswijk
 Tel. (+31-70) 340-2040, Tx. 31 651 epo nl.
 Fax: (+31-70) 340-3016

Authorized officer

Van Nieuwenhuize, O

INTERNATIONAL SEARCH REPORT

International Application No
PCT/JP 98/02263

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 053 176 A (PETER D. CAMERON ET AL) 1 October 1991	18
A	see column 2, line 37 - line 68; figures 1-3	21, 22
Y	---	3
A	DE 33 34 269 A (HERMANN BERSTORFF MASCHINENBAU GMBH) 11 April 1985 see page 5, paragraph 4 - page 7, last paragraph; claim 1; figure 1	1, 4, 18
Y	---	5, 7, 14, 17
A	US 5 620 642 A (MASAYUKI KAMITE ET AL) 15 April 1997 cited in the application see column 38, line 15 - column 45, line 37; claims 7-23; figures 1, 7, 8	6, 8, 15, 16
A	---	9-13
A	US 5 217 800 A (MARK A. J. PENTECOST) 8 June 1993 see claim 17; figures 6-9	1
A	---	1
A	US 3 388 196 A (THOMAS J. FARRELL) 11 June 1968 see column 4, line 11 - line 16 see column 4, line 39 - line 47	1, 18
A	---	1
A	US 5 126 088 A (THOMAS ANDRES) 30 June 1992 see claim 1; figures 1, 9	1
A	---	1
A	EP 0 553 005 A (USIPLAST) 28 July 1993 see claim 8; figures 1, 2	1
A	---	1
A	DE 41 18 624 C (POLARCUP GMBH) 30 April 1992 see claim 1	1
A	---	1
A	DE 20 20 758 A (DYNAMIT NOBEL AG) 18 November 1971 see claim 1	1
A	---	2, 4
A	DATABASE WPI Section Ch, Week 7821 Derwent Publications Ltd., London, GB; Class A32, AN 78-37610A XP002074510 & JP 53 041 366 A (AOI PLAS KK) see abstract; figures 1, 2 see column 9, line 29 - line 33	2, 4
A	---	2, 4
A	US 3 769 380 A (DONALD FIELD WILEY) 30 October 1973 see column 3, paragraph 2 see column 4, line 67 - column 5, line 18; figure 1	2, 4
	---	-/-

INTERNATIONAL SEARCH REPORT

International Application No

PCT/JP 98/02263

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	PATENT ABSTRACTS OF JAPAN vol. 9, no. 60 (M-364), 16 March 1985 & JP 59 194824 A (UBE KOSAN KK), 5 November 1984 see abstract -----	30-34
9		

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/JP 98/02263

Patent document cited in search report		Publication date		Patent family member(s)		Publication date
US 3966857	A	29-06-1976	CA	930130 A		17-07-1973
DE 1933570	A	21-01-1971		NONE		
US 5053176	A	01-10-1991	US	5232751 A		03-08-1993
DE 3334269	A	11-04-1985		NONE		
US 5620642	A	15-04-1997	AU	663651 B		12-10-1995
			AU	6156394 A		26-09-1994
			CA	2134981 A,C		06-09-1994
			CN	1104410 A		28-06-1995
			EP	0655310 A		31-05-1995
			WO	9420280 A		15-09-1994
			JP	2544310 B		16-10-1996
			NZ	262190 A		21-12-1995
US 5217800	A	08-06-1993	AT	394051 B		27-01-1992
			WO	9006218 A		14-06-1990
			AU	641906 B		07-10-1993
			AU	4651989 A		26-06-1990
			CA	2004788 A		06-06-1990
			DE	8915788 U		06-06-1991
			DE	58905925 D		18-11-1993
			DK	106391 A		06-08-1991
			EP	0447423 A		25-09-1991
			ES	2047312 T		16-02-1994
			FI	93327 B		15-12-1994
			HU	211426 B		28-11-1995
			JP	4502132 T		16-04-1992
US 3388196	A	11-06-1968		NONE		
US 5126088	A	30-06-1992		NONE		
EP 553005	A	28-07-1993	FR	2686544 A		30-07-1993
			DE	69306819 D		06-02-1997
DE 4118624	C	30-04-1992	AU	1907692 A		08-01-1993
			WO	9221505 A		10-12-1992

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/JP 98/02263

Patent document cited in search report		Publication date		Patent family member(s)		Publication date
DE 4118624	C		EP	0587661 A		23-03-1994
DE 2020758	A	18-11-1971	BE	766377 A		16-09-1971
			FR	2090741 A		14-01-1972
			GB	1345540 A		30-01-1974
			LU	62710 A		20-08-1971
			NL	7104233 A		01-11-1971
			US	3906065 A		16-09-1975
US 3769380	A	30-10-1973		NONE		

PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT

To:

KITAMURA, Hitoshi
Patent Attorney
4th Floor Oumikaikan Bldg., 3-7,
Higashi-Nihonbashi 3-chome, Chuo-ku
Tokyo 103
JAPON

WRITTEN OPINION

(PCT Rule 66)

Date of mailing
(day/month/year)

21.09.1999

Applicant's or agent's file reference FP-119-PCT		REPLY DUE within <u>3</u> months/days from the above date of mailing
International application No. PCT/JP 98/ 02263	International filing date (day/month/year) 22/05/1998	Priority date (day/month/year) 04/12/1997
International Patent Classification (IPC) or both national classification and IPC B29C47/04		
Applicant MISAWA HOMES CO., LTD. et al.		

1. This written opinion is the first (first, etc.) drawn up by this International Preliminary Examining Authority.

2. This opinion contains indications relating to the following items:

- I Basis of the opinion
- II Priority
- III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV Lack of unity of invention
- V Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI Certain documents cited
- VII Certain defects in the international application
- VIII Certain observations on the international application

3. The applicant is hereby invited to reply to this opinion.

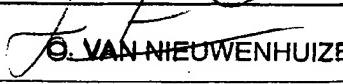
When? See the time limit indicated above. The applicant may, before the expiration of that time limit, request this Authority to grant an extension, see Rule 66.2(d).

How? By submitting a written reply, accompanied, where appropriate, by amendments, according to Rule 66.3. For the form and the language of the amendments, see Rules 66.8 and 66.9.

Also For an additional opportunity to submit amendments, see Rule 66.4. For the examiner's obligation to consider amendments and/or arguments, see Rule 66.4bis. For an informal communication with the examiner, see Rule 66.6.

If no reply is filed, the international preliminary examination report will be established on the basis of this opinion.

4. The final date by which the international preliminary examination report must be established according to Rule 69.2 is: **04/04/2000**

Name and mailing address of the IPEA/  European Patent Office, P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Netherlands Tel.: (+ 31-70) 340-2040, Tx. 31 651 epo nl Fax: (+ 31-70) 340-3016	Authorized officer Examiner 
	Formalities officer (incl. extension of time limits) Telephone No.

I. Basis of the opinion

1. This opinion has been drawn up on the basis of (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

the international application as originally filed

the description, pages ,as originally filed
pages ,filed with the demand
pages , filed with the letter of

the claims Nos. ,as originally filed
Nos. ,as amended under Article 19
Nos. , filed with the demand
Nos. , filed with the letter of

the drawings, sheets / fig. ,as originally filed
sheets / fig. , filed with the demand
sheets / fig. , filed with the letter of

2. The amendments have resulted in the cancellation of:

the description, pages:
 the claims, Nos.
 the drawings, sheets / fig.

3. This opinion has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2 (c)).

4. Additional observations, if necessary:

V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty	Claims
	Claims 1, 18
Inventive Step	Claims
	Claims 1-17, 19, 21, 23, 25
Industrial Applicability	Claims
	Claims

2. Citations and Explanations

1. Reference is made to the following documents:

D1: US-A-3966857
D2: US-A-3388196
D3: JP-A-62198435
D4: US-A-5620642
D5: US-A-5217800

2. The following is stated under reference to paragraph 1 of box VIII.

2.1 D1 (cf. claim 1, column 2, lines 34 - 39, figure 1) discloses a method of manufacturing moldings using a mixing device for extrusion molding (2) including a main cylinder (4) positioned and a metal mold (8) for forming moldings, and a main screw (6) rotated in said main cylinder (4) for mixing resin material and delivering the same to said metal mold (8).

D2 (cf. column 4, lines 11 - 47, figure 1) discloses also a method of manufacturing moldings using a mixing device for extrusion molding (10) including a main cylinder (14) positioned and a metal mold (11) for forming moldings, and a main screw (18, 19) rotated in said main cylinder (14) for mixing resin material and delivering the same to said metal mold (11).

The problem underlying claim 1 appears to incomplete mix resin in order to give coloring to the resin molding while preventing lowering of strength of the resin molding, cf. page 2, paragraphs 2 and 3 appears to be solved by both D1 (cf. column 1, lines 42 - 44) taking the extrusion temperatures for PVC fusion into account and D2 (cf. examples).

Since the expression "immediately before delivery to a metal mold, outer resin material positioned on the main cylinder inner wall side is put in the molten state, and inner resin material positioned on the main screw side is controlled to be from the softening temperature to the melting temperature both inclusive" cannot be taken into consideration for distinguishing over the prior art (see under VIII, 1.2), the subject-matter of claim 1 as far as can be understood is deprived of novelty.

Therefore claim 1 does not fulfill the requirements of Article 33(2) PCT.

- 2.2 A mixing device for manufacturing moldings including a main cylinder connected with a metal mold for molding moldings, and a main screw rotated in said main cylinder for mixing resin material and delivering the same to said metal mold is well known, see for instance D1 (cf. figure 1, column 1, line 60 - 65), D2 (cf. abstract), D3 (cf. figure 1).

Since the term "wherein said device is formed in such a manner, that immediately before delivery to a metal mold, outer resin material positioned on the inner wall side is put in the molten state and inner resin material positioned on the main screw is controlled to be from the softening temperature to the melting temperature both inclusive" cannot be taken into consideration for distinguishing over the prior art (see under VIII, 1.3), the subject-matter of claim 18 as far as can be understood is deprived of novelty.

Therefore claim 18 does not fulfill the requirements of Article 33(2) PCT.

3. Dependent claims 2 - 17, 19, 21, 23, 25 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of inventive step, the reasons being as follows:

- differently colored resin material, cf. claim 2 is already known from D2, cf. claim 1;
- later thrown in resin material (i.e. downstream feeding) cf. claims 3 and 4, is commonly practised, see for instance D3, cf. figure 4;
- the use of cellulose material, cf. claims 5 - 8, 14 - 17 is known from US-A-5620642, cf.

claim 1;

- the use regenerated resin, cf. claims 9 - 13, is known from D5, cf. claim 17;
 - a sub-throw in machine, cf. claim 19, including a screw, cf. claim 23 is known from D3, cf. figure 4;
 - since it is well known that holes in extruder barrels can be employed for venting or feeding, the fact that the receiving hole can be employed as vent hole, cf. claim 21, is rather a well known feature of optional use than a technical feature of the hole itself.
4. The combination of the features of dependent claims 20, 22, 24, 26 - 29 is neither known, nor rendered obvious from the available prior art. It is suggested therefore that a new independent claim be drafted to include the features of claims 18, 19, 20, bearing in mind that the features known from D3 should be placed in the preamble of such a claim in accordance with Rule 6.3(b) PCT. The description should in thereby be brought in conformity with the claims as required by Rule 5.1(a)(iii) PCT. Care should be taken not to amend the application in such a way, that it contains subject-matter which extends beyond. The applicant is invited to file amendments by way of replacement pages in the manner stipulated by Rule 66.8(a) PCT. In particular, fair copies of the amendments should be filed preferably in triplicate.

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

1. Independent claims 1 and 18 are not in the two-part form in accordance with Rule 6.3(b) PCT, which in the present case would be appropriate, with those features known in combination from the prior art (respective documents D1, D2 or D3) being placed in the preambles (Rule 6.3(b)(i) PCT) and with the remaining features being included in the characterising parts (Rule 6.3(b)(ii) PCT).
2. According to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents D1, D2 and D3 should be mentioned in the description and these documents should be identified therein.
3. The apparatus features of the claims should be provided with reference signs placed in parentheses, Rule 6.2(b) PCT.
4. It appears that with the term "mood" on page 5, line 6 "wood" is meant.
5. According to the requirements of Rule 11.13(l) reference signs not appearing in the description shall not appear in the drawings, and vice versa. This requirement does not appear to be met in view of the reference signs 12A and 30.

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

- 1.1 Since before the use of the term "this side" no side has been defined or mentioned in claims 1 and 18 it is unclear to which feature the term "this side" refers, thereby resulting in lack of clarity of claims 1 and 18 (Article 6 PCT).
 - 1.2 One of the features of mixing resin material during extrusion technology is that the resin material elements are continuously displaced in various directions throughout the screw channel, for which reason such an element may be in contact with the screw surface and the barrel (cylinder inner wall surface) within one screw revolution. This implies, that the same material elements are part of the material resin layer in contact with the barrel and the material resin layer in contact with the screw surface within one screw revolution. Therefore the terms "outer resin material" and "inner resin material" appear to be vague. Therefore the meaning of the expressions "immediately before delivery to a metal mold, outer resin material positioned on the main cylinder inner wall side is put in the molten state, and inner resin material positioned on the main screw side is controlled to be from the softening temperature to the melting temperature both inclusive" is not clear, thereby resulting in lack of clarity of claims 1 and 18 (Article 6 PCT).
 - 1.3 The expression "wherein said device is formed in such a manner, that immediately before delivery to a metal mold, outer resin material positioned on the inner wall side is put in the molten state and inner resin material positioned on the main screw is controlled to be from the softening temperature to the melting temperature both inclusive" defines the device of claim 18 by a result to be achieved when using the device, rather than by referring to features of the device itself, thereby resulting in lack of clarity, Article 6 PCT, (see also the PCT Guidelines, PCT/GL/3 III, 4.7 and 4.8 a).
 - 1.4 The term "a mixing device for manufacturing moldings, in a mixing device for extrusion molding including a main cylinder" is unclear, thereby rendering claim 18 unclear, Article 6 PCT.
-
2. Since the screw (12) does not appear to contain a hole, the subject-matter of claims 30 - 34 lack clarity, Article 6 PCT.

PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

International Application No.

PCT

22.5.98

受領印

International Filing Date

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference
(if desired) (12 characters maximum)

FP-119-PCT

Box No. I TITLE OF INVENTION

METHOD OF MANUFACTURING MOLDING AND MIXING DEVICE FOR
MANUFACTURING MOLDING

Box No. II APPLICANT

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (i.e. country) of residence if no State of residence is indicated below.)

MISAWA HOMES CO., LTD.

4-5, Takaido-Higashi 2-chome,
Suginami-ku, Tokyo 168-0072 JAPAN

This person is also inventor.

Telephone No.
03-3247-2014

Faximile No.
03-3332-4176

Teleprinter No.

State (i.e. country) of nationality:

JAPAN

State (i.e. country) of residence:

JAPAN

This person is applicant
for the purposes of:

all designated
States

all designated States except
the United States of America

the United States
of America only

the States indicated in
the Supplemental Box

Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (i.e. country) of residence if no State of residence is indicated below.)

KATO Masami

c/o MISAWA HOMES CO., LTD.

4-5, Takaido-Higashi 2-chome,
Suginami-ku, Tokyo 168-0072 JAPAN

This person is:

applicant only

applicant and inventor

inventor only (If this check-box
is marked, do not fill in below.)

State (i.e. country) of nationality:

JAPAN

State (i.e. country) of residence:

JAPAN

This person is applicant
for the purposes of:

all designated
States

all designated States except
the United States of America

the United States
of America only

the States indicated in
the Supplemental Box

Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf
of the applicant(s) before the competent International Authorities as:

agent

common representative

Name and address: (Family name followed by given name; for a legal entity, full official designation.
The address must include postal code and name of country.)

Telephone No.

03-3667-4402

8902 Patent Attorney KIMURA Takaaki

Faximile No.

4th Floor, Oumikaikan Building

3-7, Higashi-Nihonbashi 3-chome,

Chuo-ku, Tokyo 103-0004 JAPAN

03-3667-4403

Teleprinter No.

Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to
indicate a special address to which correspondence should be sent.

Continuation of Box No. III FURTHER APPLICANTS AND/OR (FURTHER) INVENTORS

If none of the following sub-boxes is used, this sheet is not to be included in the request.

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (i.e. country) of residence if no State of residence is indicated below.)

HASUMI Konomi
c/o MISAWA HOMES CO., LTD.
4-5, Takanido-Higashi 2-chome,
Suginami-ku, Tokyo 168-0072 JAPAN

This person is:

- applicant only
 applicant and inventor
 inventor only (If this check-box is marked, do not fill in below.)

State (i.e. country) of nationality:

JAPAN

State (i.e. country) of residence:

JAPAN

This person is applicant
for the purposes of: all designated States all designated States except the United States of America the United States of America only the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (i.e. country) of residence if no State of residence is indicated below.)

ISHIKAWA Masatoshi
c/o SUMIYOSHI KASEI CORPORATION
779-6, Shinozu, Shiraoka-machi,
Minamisaitama-gun, Saitama 349-0204 JAPAN

This person is:

- applicant only
 applicant and inventor
 inventor only (If this check-box is marked, do not fill in below.)

State (i.e. country) of nationality:

JAPAN

State (i.e. country) of residence:

JAPAN

This person is applicant
for the purposes of: all designated States all designated States except the United States of America the United States of America only the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (i.e. country) of residence if no State of residence is indicated below.)

This person is:

- applicant only
 applicant and inventor
 inventor only (If this check-box is marked, do not fill in below.)

State (i.e. country) of nationality:

State (i.e. country) of residence:

This person is applicant
for the purposes of: all designated States all designated States except the United States of America the United States of America only the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (i.e. country) of residence if no State of residence is indicated below.)

This person is:

- applicant only
 applicant and inventor
 inventor only (If this check-box is marked, do not fill in below.)

State (i.e. country) of nationality:

State (i.e. country) of residence:

This person is applicant
for the purposes of: all designated States all designated States except the United States of America the United States of America only the States indicated in the Supplemental Box Further applicants and/or (further) inventors are indicated on another continuation sheet.

Box No.V DESIGNATION OF STATES

The following designations are hereby made under Rule 4.9(a) (*mark the applicable check-boxes; at least one must be marked*):

Regional Patent

- AP ARIPO Patent: GH Ghana, KE Kenya, LS Lesotho, MW Malawi, SD Sudan, SZ Swaziland, UG Uganda, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- EA Eurasian Patent: AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- EP European Patent: AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- OA OAPI Patent: BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (*if other kind of protection or treatment desired, specify on dotted line*)

National Patent (if other kind of protection or treatment desired, specify on dotted line):

- | | |
|---|--|
| <input checked="" type="checkbox"/> AL Albania | <input checked="" type="checkbox"/> LV Latvia |
| <input checked="" type="checkbox"/> AM Armenia | <input checked="" type="checkbox"/> MD Republic of Moldova |
| <input checked="" type="checkbox"/> AT Austria | <input checked="" type="checkbox"/> MG Madagascar |
| <input checked="" type="checkbox"/> AU Australia | <input checked="" type="checkbox"/> MK The former Yugoslav Republic of Macedonia |
| <input checked="" type="checkbox"/> AZ Azerbaijan | <input checked="" type="checkbox"/> MN Mongolia |
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| <input checked="" type="checkbox"/> EE Estonia | <input checked="" type="checkbox"/> SK Slovakia |
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| <input checked="" type="checkbox"/> FI Finland | <input checked="" type="checkbox"/> TJ Tajikistan |
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| <input checked="" type="checkbox"/> GE Georgia | <input checked="" type="checkbox"/> TR Turkey |
| <input checked="" type="checkbox"/> GH Ghana | <input checked="" type="checkbox"/> TT Trinidad and Tobago |
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| <input checked="" type="checkbox"/> KG Kyrgyzstan | <input checked="" type="checkbox"/> YU Yugoslavia |
| <input type="checkbox"/> KP Democratic People's Republic of Korea | <input checked="" type="checkbox"/> ZW Zimbabwe |
| <input checked="" type="checkbox"/> KR Republic of Korea | <input checked="" type="checkbox"/> ID Indonesia |
| <input checked="" type="checkbox"/> KZ Kazakstan | <input checked="" type="checkbox"/> GW Guinea-Bissau |
| <input checked="" type="checkbox"/> LC Saint Lucia | <input type="checkbox"/> |
| <input checked="" type="checkbox"/> LK Sri Lanka | <input type="checkbox"/> |
| <input checked="" type="checkbox"/> LR Liberia | <input type="checkbox"/> |
| <input checked="" type="checkbox"/> LS Lesotho | <input type="checkbox"/> |
| <input checked="" type="checkbox"/> LT Lithuania | <input type="checkbox"/> |
| <input checked="" type="checkbox"/> LU Luxembourg | <input type="checkbox"/> |

Check-boxes reserved for designating States (for the purposes of a national patent) which have become party to the PCT after issuance of this sheet:

- ID Indonesia
- GW Guinea-Bissau
-
-
-

In addition to the designations made above, the applicant also makes under Rule 4.9(b) all designations which would be permitted under the PCT except the designation(s) of
 The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (*Confirmation of a designation consists of the filing of a notice specifying that designation and the payment of the designation and confirmation fees. Confirmation must reach the receiving Office within the 15-month time limit.*)

Box No. VI PRIORITY CLAIMFurther priority claims are indicated in the Supplemental Box

The priority of the following earlier application(s) is hereby claimed:

Country (in which, or for which, the application was filed)	Filing Date (day/month/year)	Application No.	Office of filing (only for regional or international application)
item (1) Japan	04.12.97	Patent Application 9-333779	
item (2)			
item (3)			

Mark the following check-box if the certified copy of the earlier application is to be issued by the Office which for the purposes of the present international application is the receiving Office (a fee may be required):

 The receiving Office is hereby requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) identified above as item(s): (1)**Box No. VII INTERNATIONAL SEARCHING AUTHORITY**

Choice of International Searching Authority (ISA) (If two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used): ISA / EP

Earlier search Fill in where a search (international, international-type or other) by the International Searching Authority has already been carried out or requested and the Authority is now requested to base the international search, to the extent possible, on the results of that earlier search. Identify such search or request either by reference to the relevant application (or the translation thereof) or by reference to the search request:
Country (or regional Office): Date (day/month/year): Number:**Box No. VIII CHECK LIST**

This international application contains the following number of sheets:

- | | |
|------------------|-----------|
| 1. request : | 4 sheets |
| 2. description : | 27 sheets |
| 3. claims : | 5 sheets |
| 4. abstract : | 1 sheets |
| 5. drawings : | 9 sheets |
| Total : | 46 sheets |

This international application is accompanied by the item(s) marked below:

- | | |
|---|--|
| 1. <input type="checkbox"/> separate signed power of attorney | 5. <input checked="" type="checkbox"/> V fee calculation sheet |
| 2. <input type="checkbox"/> copy of general power of attorney | 6. <input type="checkbox"/> separate indications concerning deposited microorganisms |
| 3. <input type="checkbox"/> statement explaining lack of signature | 7. <input type="checkbox"/> nucleotide and/or amino acid sequence listing (diskette) |
| 4. <input type="checkbox"/> priority document(s) identified in Box No. VI as item(s): | 8. <input checked="" type="checkbox"/> V other (specify): Request for transmittal of priority document |

Figure No. 1 of the drawings (if any) should accompany the abstract when it is published.

Box No. IX SIGNATURE OF APPLICANT OR AGENT

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).



KIMURA Takaaki

For receiving Office use only

- | | |
|---|---|
| 1. Date of actual receipt of the purported international application: | 2. Drawings: |
| 3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application: | <input type="checkbox"/> received:
<input type="checkbox"/> not received: |
| 4. Date of timely receipt of the required corrections under PCT Article 11(2): | |
| 5. International Searching Authority specified by the applicant: ISA / | 6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid |

For International Bureau use only

Date of receipt of the record copy by the International Bureau:

This sheet is not part of and does not count as a sheet of the international application.

PCT

FEE CALCULATION SHEET Annex to the Request

For receiving Office use only

Applicant's or agent's file reference	FP-119-PCT	International application No.
Applicant	Date stamp of the receiving Office	
CALCULATION OF PRESCRIBED FEES		
1. TRANSMITTAL FEE	18,000	T
2. SEARCH FEE	152,000	S
International search to be carried out by _____ (If two or more International Searching Authorities are competent in relation to the international application, indicate the name of the Authority which is chosen to carry out the international search.)		
3. INTERNATIONAL FEE		
Basic Fee		
The international application contains <u>46</u> sheets.		
first 30 sheets	55,000	b ₁
<u>16</u> x <u>1,300</u> =	<u>20,800</u>	b ₂
remaining sheets additional amount		
Add amounts entered at b ₁ and b ₂ and enter total at B	75,800	B
Designation Fees		
The international application contains <u>72</u> designations.		
<u>11</u> x <u>12,700</u> =	<u>139,700</u>	D
number of designation fees	amount of designation fee	
payable (maximum 11)		
Add amounts entered at B and D and enter total at I	215,500	I
(Applicants from certain States are entitled to a reduction of 75% of the international fee. Where the applicant is (or all applicants are) so entitled, the total to be entered at I is 25% of the sum of the amounts entered at B and D.)		
4. FEE FOR PRIORITY DOCUMENT		
5. TOTAL FEES PAYABLE		
Add amounts entered at T, S, I and P, and enter total in the TOTAL box		
		385,500
		TOTAL
<input type="checkbox"/> The designation fees are not paid at this time.		
MODE OF PAYMENT		
<input type="checkbox"/> authorization to charge deposit account (see below)	<input type="checkbox"/> bank draft	<input type="checkbox"/> coupons
<input type="checkbox"/> cheque	<input type="checkbox"/> cash	<input type="checkbox"/> other (specify): _____
<input type="checkbox"/> postal money order	<input type="checkbox"/> revenue stamps	
DEPOSIT ACCOUNT AUTHORIZATION (this mode of payment may not be available at all receiving Offices)		
The RO/ <input type="checkbox"/>	is hereby authorized to charge the total fees indicated above to my deposit account.	
<input type="checkbox"/> is hereby authorized to charge any deficiency or credit any overpayment in the total fees indicated above to my deposit account.		
<input type="checkbox"/> is hereby authorized to charge the fee for preparation and transmittal of the priority document to the International Bureau of WIPO to my deposit account.		
Deposit Account Number	Date (day/month/year)	Signature

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF THE RECORDING
OF A CHANGE(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)Date of mailing (day/month/year)
15 March 1999 (15.03.99)

From the INTERNATIONAL BUREAU

To:

KITAMURA, Hitoshi
Oumikaikan Building
4th floor
3-7, Higashi-Nihonbashi 3-chome
Chuo-ku
Tokyo 103-0004
JAPONApplicant's or agent's file reference
FP-119-PCT

IMPORTANT NOTIFICATION

International application No.
PCT/JP98/02263International filing date (day/month/year)
22 May 1998 (22.05.98)

1. The following indications appeared on record concerning:

 the applicant the inventor the agent the common representative

Name and Address

KIMURA, Takaaki
Oumikaikan Building
4th floor
3-7, Higashi-Nihonbashi 3-chome
Chuo-ku
Tokyo 103-0004
Japan

State of Nationality

State of Residence

Telephone No.

Facsimile No.

Teleprinter No.

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

 the person the name the address the nationality the residence

Name and Address

KITAMURA, Hitoshi
Oumikaikan Building
4th floor
3-7, Higashi-Nihonbashi 3-chome
Chuo-ku
Tokyo 103-0004
Japan

State of Nationality

State of Residence

Telephone No.

Facsimile No.

Teleprinter No.

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

<input checked="" type="checkbox"/> the receiving Office	<input type="checkbox"/> the designated Offices concerned
<input type="checkbox"/> the International Searching Authority	<input type="checkbox"/> the elected Offices concerned
<input type="checkbox"/> the International Preliminary Examining Authority	<input type="checkbox"/> other:

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Authorized officer

Y. KUWAHARA

Facsimile No.: (41-22) 740.14.35

Telephone No.: (41-22) 338.83.38

PATENT COOPERATION TREATY

PCT

NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

From the INTERNATIONAL BUREAU

To:

KITAMURA, Hitoshi
 Oumikaikan Building
 4th floor
 3-7, Higashi-Nihonbashi 3-chome
 Chuo-ku
 Tokyo 103-0004
 JAPON

Date of mailing (day/month/year)
 10 June 1999 (10.06.99)

Applicant's or agent's file reference
 FP-119-PCT

IMPORTANT NOTICE

International application No.
 PCT/JP98/02263

International filing date (day/month/year)
 22 May 1998 (22.05.98)

Priority date (day/month/year)
 04 December 1997 (04.12.97)

Applicant

MISAWA HOMES CO., LTD. et al

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:

AU,CN,EP,IL,KR,US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:

AL,AM,AP,AT,AZ,BA,BB,BG,BR,BY,CA,CH,CU,CZ,DE,DK,EA,EE,ES,FI,GB,GE,GH,GW,HU,ID,IS,
 KE,KG,KZ,LC,LK,LR,LS,LT,LU,LV,MD,MG,MK,MN,MW,MX,NO,NZ,OA,PL,PT,RO,RU,SD,SE,SG,SI,
 SK,SL,TJ,TM,TR,TT,UA,UG,UZ,VN,YU,ZW

The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on
 10 June 1999 (10.06.99) under No. WO 99/28110

REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a demand for international preliminary examination must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the national phase, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

The International Bureau of WIPO
 34, chemin des Colombettes
 1211 Geneva 20, Switzerland

Facsimile No. (41-22) 740.14.35

Authorized officer

J. Zahra

Telephone No. (41-22) 338.83.38

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION
(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

United States Patent and Trademark
Office
(Box PCT)
Crystal Plaza 2
Washington, DC 20231
ÉTATS-UNIS D'AMÉRIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 15 July 1999 (15.07.99)	To: United States Patent and Trademark Office (Box PCT) Crystal Plaza 2 Washington, DC 20231 ÉTATS-UNIS D'AMÉRIQUE
International application No. PCT/JP98/02263	Applicant's or agent's file reference FP-119-PCT
International filing date (day/month/year) 22 May 1998 (22.05.98)	Priority date (day/month/year) 04 December 1997 (04.12.97)
Applicant KATO, Masami et al	

1. The designated Office is hereby notified of its election made:

in the demand filed with the International Preliminary Examining Authority on:

02 July 1999 (02.07.99)

in a notice effecting later election filed with the International Bureau on:

2. The election was

was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer Sean Taylor
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

091555168

PATENT COOPERATION TREATY

1701

PCT

REC'D 20 MARS 2000
WIPO
PCT

14

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

1732

Applicant's or agent's file reference FP-119-PCT	FOR FURTHER ACTION		See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/JP98/02263	International filing date (day/month/year) 22/05/1998	Priority date (day/month/year) 04/12/1997	
International Patent Classification (IPC) or national classification and IPC B29C47/04			
Applicant MISAWA HOMES CO., LTD. et al.			

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 10 sheets, including this cover sheet.

- This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 19 sheets.

3. This report contains indications relating to the following items:

- I Basis of the report
- II Priority
- III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV Lack of unity of invention
- V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI Certain documents cited
- VII Certain defects in the international application
- VIII Certain observations on the international application

TECHNOLGY CENTER 1700

Date of submission of the demand 02/07/1999	Date of completion of this report 16.03.00
Name and mailing address of the international preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized officer Van Nieuwenhuize, O Telephone No. +31 70 340 3435



**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/JP98/02263

I. Basis of the report

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

Description, pages:

1,18-25	as originally filed	
2-8,13-17,26,27	with telefax of	08/12/1999

Claims, No.:

1,2,14-17,20,22,	with telefax of	08/12/1999
24,27-29,31-36		

Drawings, sheets:

1/9-9/9	as originally filed
---------	---------------------

2. The amendments have resulted in the cancellation of:

the description, pages: 9-12
 the claims, Nos.: 3-13, 18, 19, 21, 23, 25, 26, 30
 the drawings, sheets:

3. This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/JP98/02263

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims 1, 2, 14-17, 20, 22, 24, 27-29, 31-36
	No:	Claims
Inventive step (IS)	Yes:	Claims 20, 22, 24, 27-29, 31-36
	No:	Claims 1, 2, 14-17
Industrial applicability (IA)	Yes:	Claims 1, 2, 14-17, 20, 22, 24, 27-29, 31-36
	No:	Claims

2. Citations and explanations

see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/JP98/02263

Re Item I

Basis of the report

The examination is being carried out on the **following application documents:**

Text for the Contracting States:

AT BE CH DE DK ES FI FR GB GR IT IE LI LU MC NL PT SE

Description, pages:

1,18-25 as originally filed

2-8,13-17,26,27 with telefax of 08/12/1999

Claims, No.:

1,2,14-17,20,22, with telefax of 08/12/1999
24,27-29,31-36

Drawings, sheets:

1/9-9/9 as originally filed

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/JP98/02263

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Reference is made to the following documents:

D3: JP-A-62198435

D4: US-A-5620642

2. The following is stated under reference to paragraph 1 of box VIII.

2.1 Document D3 (cf. abstract, figures 2 - 4) discloses a method of manufacturing moldings using a mixing device for extrusion molding including a main cylinder connected to a metal mold for forming moldings, a main screw rotated in said main cylinder for mixing resin material and delivering the same to said metal mold, a main throw-in machine connected to said main cylinder at the start end part thereof, and a sub-throw-in machine connected to said main cylinder at the part between said metal mold and said main throw-in machine, whereby resin material, which partly forms the outer part of said molding (cf. figure 4), is thrown into said main cylinder from said sub-throw-in machine, and resin material, which forms at least partly the inner part of said molding is thrown into said main cylinder from said main throw-in machine.

The subject-matter of claim 1 differs therefrom in that cellulose material, which is fixed grains formed by fixing surface grains which have a diameter smaller than that of pulverized powder obtained by pulverizing cellulose material and are harder than said powder to the outer peripheral surface of said pulverized powder, is mixed with said outer resin material.

Therefore claim 1 appears to fulfill the requirements of Article 33(2) PCT.

The objective problem to be solved by the present invention may therefore be regarded as to provide a method of manufacturing a molding having the woody feel, cf. page 3, lines 5 - 6.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/JP98/02263

However cellulose material, which is fixed grains formed by fixing surface grains which have a diameter smaller than that of pulverized powder obtained by pulverizing cellulose material and are harder than said powder to the outer peripheral surface of said pulverized powder mixed with outer resin material has already been employed for the same purpose in a similar method, see document D4 (cf. claim 1, column 1, lines 5 - 15). It would be obvious to the person skilled in the art, namely when the same result is to be achieved, to apply this feature with corresponding effect to a method according to document D3, thereby arriving at a method according to claim 1, for which reason the subject-matter of claim 1 does therefore not involve an inventive step.

Therefore claim 1 does not fulfill the requirements of Article 33(3) PCT.

- 2.2 Document D3 (cf. abstract, figures 2 - 4) discloses further a mixing device for manufacturing moldings comprising a main cylinder connected to a metal mold for molding moldings, a main screw rotated in said main cylinder for mixing resin material and delivering the same to said metal mold, a main throw-in machine connected to said main cylinder at the start end part thereof, and a sub-throw-in machine connected to said main cylinder at the part between said metal mold and said main throw-in machine, a holding part, a sub-throw-in hole and obviously a receiving hole positioned in said main cylinder between said metal mold and said main throw-in machine.

The subject-matter of claim 20 differs therefrom in that the rotating direction side of said main screw in the cylinder inner wall of said receiving hole of said main cylinder is formed in such a manner as to expand said receiving hole.

Therefore claim 20 appears to fulfill the requirements of Article 33(2) PCT.

Under reference to Box VIII, paragraph 1.2, figure 8 and page 20 paragraph 2, it appears that the subject-matter of claim 20 thus differs from that what is known from D3 in that the main cylinder comprises an undercut notched part for increasing the cross sectional area of the receiving hole in the direction of the main screw.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/JP98/02263

The problem to be solved could be regarded as the smoothly feeding resin material, cf. page 20, paragraph 3.

Therefore claim 20 appears to fulfill the requirements of Article 33(3) PCT.

3.1 Dependent claims 2, 14 -17 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of inventive step, the reasons being as follows:

- differently colored resin material, cf. claim 2 is already known from D3, cf. abstract and D4, cf. column 36, lines 26 - 31;
- cellulose material mixed with inner resin material, cf. claims 14 - 17 is known from US-A-5620642, cf. column 35, line 55 - column 37, line 11.

3.2 Claims 22, 24, 27 - 29, 31- 36 are dependent on claim 20 and appear as such also to meet the requirements of the PCT with respect to novelty and inventive step.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/JP98/02263

Re Item VII

Certain defects in the international application

1. Although claim 1 is drafted in the two-part form the only feature of the second part should be "characterized in that cellulose material, which is fixed grains formed by fixing surface grains which have a diameter smaller than that of pulverized powder obtained by pulverizing cellulose material and are harder than said powder to the outer peripheral surface of said pulverized powder, is mixed with said outer resin material" (Rule 6.3(b) PCT).

Re Item VIII

Certain observations on the international application

- 1.1 The term "which forms the outer part of said molding" with respect to the term "outer resin material" and the term "which forms the inner part of said molding" with respect to the term "inner resin material", which are introduced in claims 1 and 20 by the amendments filed with the telefax dated 08.12.1999, find their basis in the description on page 20, paragraph 4. In the description it is also stated that "outer resin material" and "inner resin material" are mixed (see for instance page 23, paragraph 3), which appears to be in accordance with the term "main screw rotated in said main cylinder for mixing resin material" of claim 1.

One of the features of mixing resin material during extrusion technology is that the resin material elements are continuously displaced in various directions throughout the screw channel, for which reason such an element may be in contact with the screw surface and the barrel (cylinder inner wall surface) within one screw revolution. This implies, that the same material elements (pellets, powder or fluid resin) are part of the material resin layer in contact with the barrel and the material resin layer in contact with the screw surface within one screw revolution.

The terms "outer resin material which forms the outer part of said molding" and "inner resin material which forms the inner part of said molding" are thus in contradiction with the statement that the "outer resin material" and "inner resin material" are mixed, thereby resulting in lack of clarity of claims 1 and 18 contrary to the requirements of Article 6 PCT.

- 1.2 The expression "the rotating direction side of said main screw in the cylinder inner wall of said receiving hole of said main cylinder is formed in such a manner as to expand said receiving hole" used in claim 20 is vague and unclear and leaves the reader in doubt as to the meaning of the technical features to which it refers, thereby rendering the definition of the subject-matter of said claim unclear, contrary to the requirements of Article 6 PCT.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/JP98/02263

Apparently a main cylinder comprising an undercut notched part for increasing the cross sectional area of the receiving hole in the direction of the main screw is meant, cf. paragraph 1.2, figure 8 and page 20 paragraph 2.

- 1.3 The first and second embodiments described on pages 20 - 24 do not include a notch part, for which reason they do not fall within the scope of claim 20. This inconsistency between the claims and the description leads to doubt concerning the matter for which protection is sought, thereby rendering the claims unclear (Article 6 PCT).

formed into a desired shape by extrusion molding or injection molding. According to this technology, it is possible to provide a method of manufacturing a wood-like product and a wood-like product which has a pattern very close to the grain of natural wood and also has feeling such as the touch or the like close to the natural wood.

The technique about the device for extrusion molding is disclosed in prior art such as US-A-3966857, US-A-3388196 and JP-A-62198435.

(Disadvantage of the prior art)

It is, however, true that not only in the above technology, giving of coloring to a resin molding is hard to be incompatible with keeping the strength of the resin molding. That is, it is preferable to incompletely mix resin in order to give coloring to the resin molding, but if done so, the strength of the molding is lowered. On the contrary, if mixing is performed completely, the strength of the molding can be increased, but the coloring fades.

(Objects of the invention)

A problem to be solved by the invention is to provide the technology by which giving of coloring to a resin molding is made compatible with preventing a remarkable lowering of strength of the resin molding.

It is an object of the invention as claimed in claims 1, 2 and 14 to 17 to provide a method of manufacturing a molding by which clear colors and patterns can be presented without a remarkable lowering of strength.

It is an object of the invention as claimed in claims 20, 22, 24, 27 to 29 and 31 to 36 to provide a mixing device for extrusion molding, by which clear colors and patterns can be presented without a remarkable lowering of strength.

Further in detail, listed are the respective objects

of the invention.

The object of the invention as claimed in claims 1, 2 and 14 to 17 is to provide a manufacturing method, by which clear colors and patterns can be presented without a remarkable lowering of strength and to provide a method of manufacturing a molding having the woody feel.

The object of the invention as claimed in claims 2, 15, and 17 is to provide a manufacturing method, by which a molding having a clear pattern can be manufactured.

The object of the invention as claimed in claims 20, 22, 24, 27 to 29 and 31 to 36 is to provide a mixing device for extrusion molding, by which energy required for manufacture can be held down, and by which a molding having a clear pattern can be manufactured.

The object of the invention as claimed in claims 22, 28, 32 and 35 is to provide a mixing device for extrusion molding, by which the existing equipment can be utilized to the maximum.

DISCLOSURE OF THE INVENTION

The present invention is intended for accomplishing the described objects.

(Claim 1)

The invention as claimed in claim 1 is a molding manufacturing method using a mixing device 10 for extrusion molding comprising a main cylinder 11 positioned on this side of a metal mold for shaping a molding and a main screw 12 rotated in the main cylinder 11 for mixing resin material 20 and delivering the same to the metal mold, wherein immediately before delivery to the metal mold, an outer resin material 21 positioned on the inner wall side of the main cylinder 11 is put in the molten state, and an inner resin material 22 is put in the molten state, and an inner resin material 22

positioned on the main screw 12 side is controlled to be from the softening temperature to the melting temperature both inclusive. Moreover, cellulose material is mixed with the outer resin material 21. Furthermore, cellulose material mixed with the outer resin material 21 is fixed grains formed by fixing a surface grain which has a diameter smaller than that of the pulverized powder obtained by pulverizing the cellulose material and is harder than the powder to the outer peripheral surface of the pulverized powder.

The "main" of the "main cylinder 11" means any one of cylinders in multilayer molding, for example, and the only one cylinder in monolayer molding. The "main" of the "main screw 12" means a screw incorporated in the main cylinder, and in the case of using plural screws in the main cylinder, it means all of the screws.

As concrete means for "immediately before delivery to the metal mold, putting an outer resin material 21 positioned on the inner wall side of the main cylinder 11 in the molten state, and controlling an inner resin material 22 positioned on the main screw 12 side to be from the softening temperature to the melting temperature both inclusive", cited are means for controlling the temperature of a heater for heating the main cylinder and the main screw, means for making the particle size of resin material positioned on the main cylinder inner wall side smaller than that of resin material positioned on the main screw side, and the like.

(Description of terms)

Here, "resin material" means material used at the time of making a resin molding such as polyvinyl chloride which is thermoplastic resin or the like. Though only the resin as base material will be resin material, if wood flour (cellulose material) is contained in resin, it becomes resin

material used in the so-called wood plastic molding.

As for the resin material used in wood plastic molding, it is frequent to use the material obtained by mixing wood flour with resin and pelletizing the same in addition to the powdered material obtained by mixing wood flour with powder resin. Further, frequently in order to produce a pattern of the grain of wood, "resin material" is added to wood flour and resin to obtain a mixture of a pigment. In that case, sometimes one kind of a pigment will be sufficient, and sometimes plural kinds of pigments are used. In the case of using plural kinds of pigments, "resin material" can be made by preparing plural kinds of pellets with different pigments and mixing the same.

The cellulose material used in manufacturing fixed grains is ordinarily natural wood, or sawdust, but rice straw and bagasse may be used.

As a method of forming fixed grains by "fixing surface grains which have a diameter smaller than that of the granular powder and are harder than the powder to the surface of pulverized powder", cited are grinding using a ball mill, long-time high-speed mixing using a mixer, and so on. By these methods, fuzz of fibers of the cellulose material is decreased. Processing for removing fuzz of fibers of the cellulose material may be performed separately from fixing of surface grains.

The "surface grains" are metal, metal compounds such as titanium oxide, ferrite, aluminium, nickel, silver, calcium carbonate and the like, and nonmetal such as ceramic or the like.

The percentage of fixed grains mixed with resin to the whole is usually set not more than 30 wt%. The reason is that sometimes the fluidity at the time of melting the material

to be molded becomes worse to interfere with molding.

The material formed by mixing fixed grains with resin which is resin material may be pulverulent or be previously molded to be pelletized. In order to bring out a pattern of the grain of wood, sometimes one kind of a pigment will be sufficient, but frequently plural kinds of pigments are used. In order to use plural kinds of pigments, plural kinds of pellets having different pigments in "material formed by mixing resin and a pigment with fixed grains" are prepared and mixed to form "resin material".

As wood flour in resin material is fixed grains, it is possible to manufacture a wood-like product which has patterns very close to the grain of natural wood on the surface and also has a feeling such as the touch or the like very close to that of natural wood.

(Operation)

Immediately before delivery to the metal mold, outer resin material 21 of the resin material 20 is to be put in the molten state, so that while being clamped between the inner wall of the main cylinder 11 and an inner resin material 22, it is rubbed by the inner wall of the main cylinder 11 to be mixed. Soon at the time of delivery from the forward end of the main screw 12 to the metal mold, the material is clamped between the inner wall of the main cylinder 11 and the forward end part of the main screw 12 to be delivered.

On the other hand, the inner resin material 22 is controlled to be from the softening temperature to the melting temperature both inclusive, so that it is delivered in the state of being little mixed to the metal mold.

Since the outer resin material 21 of the resin material 20 is mixed, the strength will not be lowered remarkably unlike the case in which every resin for forming a molding is mixed

merely incompletely.

Moreover, as cellulose material is contained in the outer resin material 21, a molding has the wood feeling brought out on the surface thereof.

Furthermore, since pulverization and fixing of surface grains are performed for cellulose material mixed with resin material, fuzz of the cellulose material can be decreased so as to manufacture a molding heightened in a wood feeling.

(Claim 2)

The invention as claimed in claim 2 defines the method of manufacturing a molding as claimed in claim 1, wherein the outer resin material 21 is made different from the inner resin material 22 in color.

As means for varying the color of resin material, means for varying the kind of a pigment to be mixed with the resin material is general.

If plural kinds of pigments different in color are mixed with the outer resin material 21 turned to be molten, sometimes it is possible to bring out a delicate tone of color. Mixing to such a degree not to lower the strength of a molding causes the case where as plural kinds of pigments are made monochromatic, sometimes mixing is not completely performed.

(Operation)

According to the present invention as claimed in claim 2, the outer resin material 21 is not completely mixed with the inner resin material 22 not molten. Accordingly, it is possible to manufacture a molding which will not turn to a color intermediate between the outer resin material 21 and the inner resin material 22.

(Claim 14)

The invention as claimed in claim 14 defines the method of manufacturing a molding as claimed in claim 1, wherein

cellulose material is mixed with the inner resin material 22.

(Claim 15)

The invention as claimed in claim 15 defines the method of manufacturing a molding as claimed in claim 2, wherein cellulose material is mixed with the inner resin material 22.

(Operation)

As the cellulose material is contained not only in the outer resin material 21 but in the inner resin material 22, it is possible to provide a molding having a wood feeling all over the molding.

(Claim 16)

The invention as claimed in claim 16 defines the method of manufacturing a molding as claimed in claim 14, wherein the cellulose material mixed with the inner resin material 22 is formed by fixing surface grains which have a diameter smaller than that of pulverized powder obtained by pulverizing the cellulose material and are harder than that to the outer peripheral surface of the pulverized powder.

(Claim 17)

The invention as claimed in claim 17 defines the method of manufacturing a molding as claimed in claim 15, wherein the cellulose material mixed with the inner resin material 22 is formed by fixing surface grains which have a diameter smaller than that of pulverized powder obtained by pulverizing the cellulose material and are harder than that to the outer peripheral surface of the pulverized powder.

(Operation)

As pulverization and fixing of surface grains are performed for the cellulose material mixed with the inner resin material 22, fuzz of the cellulose material can be decreased so as to provide a molding heightened in a wood feeling of the whole molding.

(Claim 20)

The invention as claimed in claim 20, wherein in a mixing device 10 for extrusion molding comprising a main cylinder 11 for positioned on this side of a metal mold for forming a molding, and a main screw 12 rotated in the main cylinder 11 for mixing resin material 20 and delivering the same to the metal mold, immediately before delivery to the metal mold, the outer resin material 21 positioned on the inner wall side of the main cylinder 11 is put in the molten state, and the inner resin material 22 positioned on the main screw 12 side is formed in such a manner as to be controlled from the softening temperature to the melting temperature both inclusive. Moreover, the device includes a sub-throw-in machine for throwing the outer resin material 21 in the mixing device for extrusion molding, and the sub-throw-in machine is provided separately from the main throw-in machine (e.g. main hopper 13) for throwing in the inner resin material 22 and comprises an outer resin material holding part (e.g. sub-hopper 14) for holding the outer resin material 21 and a sub-throw-in hole for delivering the outer resin material 21 to the main cylinder 11, the sub-throw-in hole being communicated with a receiving hole positioned between the metal mold in the main cylinder 11 and the main throw-in machine 13. Furthermore, the receiving hole of the main cylinder 11 (e.g. formed by removing a receiving hole forming member 11A) is formed in such a manner as to expand the receiving hole 11A on the rotating direction side of the main screw 12 in the cylinder inner wall.

(Description of terms)

The "main throw-in machine" is generally called "hopper".

The sub-cylinder of the "sub-throw-in machine" may be

a hopper, but as defined in the claim 13, it may be provided with a screw.

The receiving hole 11A is expanded by providing a notch part 11F by chamfering using an inverted spot facing tool.

(Operation)

Since the outer resin material 21 of the resin material 20 is put in the molten state immediately before delivery to the metal mold, mixing is performed by rubbing of the inner wall of the main cylinder 11. Soon at the time of delivering the material from the forward end of the main screw 12 to the metal mold, the material is clamped between the inner wall of the main cylinder 11 and the forward end part of the main screw 12 to be delivered.

On the other hand, as the inner resin material 22 is controlled to be from the softening temperature to the melting temperature both inclusive, it is delivered in the state of being little mixed to the metal mold.

As the outer resin material 21 of the resin material 20 is mixed, the strength will not be remarkably lowered unlike the case of quite incomplete mixing.

Moreover, as the sub-throw-in machine is provided separately from the main throw-in machine (e.g. main hopper 13) for throwing in the inner resin material 22, it is easy to put the outer resin material 21 in the molten state and control the inner resin material 22 to be from the softening temperature to the melting temperature both inclusive.

Furthermore, as the rotating direction side of the main screw 12 in the receiving hole 11A is expanded, the outer resin material 21 can be smoothly thrown in.

(Claim 22)

The invention as claimed in claim 22 defines a mixing device for manufacturing a molding as claimed in claim 20,

and wherein the receiving hole 11A is a vent hole 11B previously provided in the mixing device 10 for extrusion molding.

(Description of terms)

Here, the "vent hole 11B" is an air vent hole provided for removing gas contained in resin material or generated from resin material. As air is let escape from the vent hole 11B according to the kind of resin material and the property of a molding in some case, if there are provided plural vent holes 11B, one can be used as a feed port for the outer resin material 21 and the other can be used as an air vent hole.

(Operation)

Since the ordinary mixing device for extrusion molding is provided with a vent hole, it can be applied, so that the existing equipment can be utilized.

(Claim 24)

The invention as claimed in claim 24 defines a mixing device for manufacturing a molding as claimed in claim 20, wherein the sub-throw-in machine 15 is provided with a sub-screw 17 rotated in the sub-cylinder 16 for mixing and delivering the outer resin material 21 held in the sub-cylinder 16.

(Operation)

On this side of a metal mold in the main cylinder 11, the outer resin material 21 to be put in the molten state is molten and mixed and then fed into the main cylinder 11 by the sub-cylinder 16 and the sub-screw 17.

(Claim 27)

The invention as claimed in claim 27 defines the mixing device for manufacturing a molding as claimed in claim 20, wherein there are provided plural (e.g. five) receiving holes of the main cylinder 11 in the direction of extrusion.

(Claim 28)

The invention as claimed in claim 28 defines the mixing device for manufacturing a molding as claimed in claim 22, wherein there are provided plural (e.g. five) receiving holes of the main cylinder 11 in the direction of extrusion.

(Claim 29)

The invention as claimed in claim 29 defines the mixing device for manufacturing a molding as claimed in claim 24, wherein there are provided plural (e.g. five) receiving holes of the main cylinder 11 in the direction of extrusion.

(Operation of claims 27 to 29)

As there are provided plural receiving holes 11 of the main cylinder 11 in the direction of extrusion, it is possible to select and use the receiving holes appropriate for a molding according to various conditions such as desired colors and patterns, the kind of resin and the like. Further, the receiving hole can be used as a vent hole.

(Claim 31)

The invention as claimed in claim 31 defines the mixing device for manufacturing a molding as claimed in claim 20, wherein the area in the main screw 12 that corresponds to the receiving hole is formed in such a manner that the diameter of the main screw 12 is smaller than that of the other area.

(Claim 32)

The invention as claimed in claim 32 defines the mixing device for manufacturing a molding as claimed in claim 22, wherein the area in the main screw 12 that corresponds to the receiving hole is formed in such a manner that the diameter of the main screw 12 is smaller than that of the other area.

(Claim 33)

The invention as claimed in claim 33 defines the mixing device for manufacturing a molding as claimed in claim 24, wherein the area in the main screw 12 that corresponds to the

receiving hole is formed in such a manner that the diameter of the main screw 12 is smaller than that of the other area.

(Claim 34)

The invention as claimed in claim 34 defines the mixing device for manufacturing a molding as claimed in claim 27, wherein the area in the main screw 12 that corresponds to the receiving hole is formed in such a manner that the diameter of the main screw 12 is smaller than that of the other area.

(Claim 35)

The invention as claimed in claim 35 defines the mixing device for manufacturing a molding as claimed in claim 28, wherein the area in the main screw 12 that corresponds to the receiving hole is formed in such a manner that the diameter of the main screw 12 is smaller than that of the other area.

(Claim 36)

The invention as claimed in claim 36 defines the mixing device for manufacturing a molding as claimed in claim 29, wherein the area in the main screw 12 that corresponds to the receiving hole is formed in such a manner that the diameter of the main screw 12 is smaller than that of the other area.

(Operation of claims 31 to 36)

The area in the main screw 12 that corresponds to the receiving hole is formed in such a manner that the diameter of the main screw 12 is smaller than that of the other area, whereby the outer resin material 21 can be smoothly thrown in from the receiving hole.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a sectional view showing the outline of a first embodiment according to the present invention; Figure 2 is an enlarged view showing the principal part in the first embodiment; Figure 3 is a sectional view showing

put in the sub-mixing machine 15 and the sub-hopper 14 as pellets different in coloring. Thus, the molten state of the outer resin material 21 can be made different from that of the first, second or third embodiment so as to contribute to a delicate coloring.

Also in the described arrangement, it is possible to manufacture moldings which are different in the appearance pattern from that of the first or second or third embodiment but have the substantially same quality as that thereof.

(Variation)

As shown in the first to fourth embodiments, plural throw-in holes can be freely formed on the mixing device 10 for manufacturing a molding, whereby it is possible to manufacture moldings, the appearances of which have various tones of color.

Further, the position of the vent hole which has been described as the same place (11C) in the above embodiments can be suitably selected.

ADVANTAGES OF THE INVENTION

According to the present invention, it is possible to provide the technology by which giving of coloring to a resin molding is made compatible with preventing a remarkable lowering of strength of the resin molding.

The advantages are listed by each claim.

According to the invention as claimed in claims 1, 2 and 14 to 17, it is possible to provide a manufacturing method, by which colors and patterns can be produced without a remarkable lowering of strength. Moreover, it is possible to provide a method of manufacturing moldings having the wood feel.

According to the invention as claimed in claims 2, 15

and 17, it is possible to provide a manufacturing method, by which moldings having clear patterns can be manufactured.

According to the invention as claimed in claims 20, 22, 24, 27 to 29 and 31 to 36, it is possible to provide a mixing device for extrusion molding, by which energy required for manufacture can be held down, and by which moldings having clear patterns can be manufactured.

According to the invention as claimed in claims 22, 28, 32 and 35, it is possible to provide a mixing device for extrusion molding, by which the existing equipment can be utilized to the utmost.

FIELD OF INDUSTRIAL USE

This invention is utilized in the field of industry using the technology of molding in such a manner as to present clear surface patterns, for example, pattern of the grain of wood and not to lower the strength remarkably in plastics containing a pigment.

CLAIMS

1. (amended) A method of manufacturing moldings (30) using a mixing device (10) for extrusion molding including a main cylinder (11) connected to a metal mold for forming moldings (30), a main screw (12) rotated in said main cylinder (11) for mixing resin material (20) and delivering the same to said metal mold, a main throw-in machine (13) connected to said main cylinder (11) at the start end part thereof, and a sub-throw-in machine (14, 15) connected to said main cylinder (11) at the part between said metal mold and said main throw-in machine (13);

characterizing in that outer resin material (21), which forms the outer part of said molding (30), is thrown into said main cylinder (11) from said sub-throw-in machine (14, 15);

that inner resin material (22), which forms the inner part of said molding (30), is thrown into said main cylinder (11) from said main throw-in machine (13); and

that cellulose material, which is fixed grains formed by fixing surface grains which have a diameter smaller than that of pulverized powder obtained by pulverizing cellulose material and are harder than said powder to the outer peripheral surface of said pulverized powder, is mixed with said outer resin material (21).

2. The method of manufacturing moldings (30) as claimed in claim 1, wherein said outer resin material (21) is made different from said inner resin material (22) in a color.

3. (cancelled)
4. (cancelled)
5. (cancelled)
6. (cancelled)
7. (cancelled)

8. (cancelled)

9. (cancelled)

10. (cancelled)

11. (cancelled)

12. (cancelled)

13. (cancelled)

14. (amended) The method of manufacturing moldings (30) as claimed in claim 1, wherein cellulose material is mixed with said inner resin material (22).

15. (amended) The method of manufacturing moldings (30) as claimed in claim 2, wherein cellulose material is mixed with said inner resin material (22).

16. (amended) The method of manufacturing moldings (30) as claimed in claim 14, wherein cellulose material mixed with said inner resin material (22) is fixed grains formed by fixing surface grains which have a diameter smaller than pulverized powder obtained by pulverizing cellulose material and are harder than said powder to the outer peripheral surface of said pulverized powder.

17. (amended) The method of manufacturing moldings (30) as claimed in claim 15, wherein cellulose material mixed with said inner resin material (22) is fixed grains formed by fixing surface grains which have a diameter smaller than pulverized powder obtained by pulverizing cellulose material and are harder than said powder to the outer peripheral surface of said pulverized powder.

18. (cancelled)

19. (cancelled)

20. (amended) A mixing device (10) for manufacturing moldings (30) comprising a main cylinder (11) connected to a metal mold for forming moldings (30), a main screw (12) rotated in said main cylinder (11) for mixing resin material

(20) and delivering the same to said metal mold, a main throw-in machine (13) connected to said main cylinder (11) at the start end part thereof for throwing inner resin material (22), which forms the inner part of said molding (30), into said main cylinder (11), a sub-throw-in machine (14, 15) connected to said main cylinder (11) at the part between said metal mold and said main throw-in machine (13) for throwing outer resin material (21), which forms the outer part of said molding (30), into said main cylinder (11), an outer resin material (21) holding part for holding said outer resin material (21), a sub-throw-in hole for delivering said outer resin material (21) to said main cylinder (11), and a receiving hole positioned, in said main cylinder (11), between said metal mold and said main throw-in machine (13);

characterizing that the rotating direction side of said main screw (12) in the cylinder inner wall of said receiving hole of said main cylinder (11) is formed in such a manner as to expand said receiving hole.

21. (cancelled)

22. The mixing device (10) for manufacturing moldings (30) as claimed in claim 20, wherein said receiving hole is a vent hole previously provided in said mixing device (10) for extrusion molding.

23. (cancelled)

24. (amended) The mixing device (10) for manufacturing moldings (30) as claimed in claim 20, wherein said sub-throw-in machine (14, 15) includes a sub-screw (17) rotated in a sub-cylinder (16) for mixing outer resin material (21) held in said sub-cylinder (16) and delivering the same.

25. (cancelled)

26. (cancelled)

27. The mixing device (10) for manufacturing moldings

(30) as claimed in claim 20, wherein there are plural receiving holes of said main cylinder (11) in the direction of extrusion.

28. (amended) The mixing device (10) for manufacturing moldings (30) as claimed in claim 22, wherein there are plural receiving holes of said main cylinder (11) in the direction of extrusion.

29. (amended) The mixing device (10) for manufacturing moldings (30) as claimed in claim 24, wherein there are plural receiving holes of said main cylinder (11) in the direction of extrusion.

31. (amended) The mixing device (10) for manufacturing moldings (30) as claimed in claim 20, wherein said main screw (12) has a small-diameter part (12A), the diameter of which is made smaller than that of other parts of said main screw (12), corresponding to the expansion of said receiving hole.

32. (amended) The mixing device (10) for manufacturing moldings (30) as claimed in claim 22, wherein said main screw (12) has a small-diameter part (12A), the diameter of which is made smaller than that of other parts of said main screw (12), corresponding to the expansion of said receiving hole.

33. (amended) The mixing device (10) for manufacturing moldings (30) as claimed in claim 24, wherein said main screw (12) has a small-diameter part (12A), the diameter of which is made smaller than that of other parts of said main screw (12), corresponding to the expansion of said receiving hole.

34. (amended) The mixing device (10) for manufacturing moldings (30) as claimed in claim 27, wherein said main screw (12) has a small-diameter part (12A), the diameter of which is made smaller than that of other parts of said main screw (12), corresponding to the expansion of said receiving hole.

35. (new) The mixing device (10) for manufacturing moldings (30) as claimed in claim 28, wherein said main screw

(12) has a small-diameter part (12A), the diameter of which is made smaller than that of other parts of said main screw (12), corresponding to the expansion of said receiving hole.

36. (new) The mixing device (10) for manufacturing moldings (30) as claimed in claim 29, wherein said main screw (12) has a small-diameter part (12A), the diameter of which is made smaller than that of other parts of said main screw (12), corresponding to the expansion of said receiving hole.